FORM PTO-1390 (REV 10-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C.371

ATTORNEY'S DOCKET NUMBER: **PVZ-007US**

U.S. APPLICATION NO. (If known, see 37 CFR 1.5): **10/019068**

INTERNATIONAL APPLICATION	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DK00/00331	**21 June 2000 (21.06.00)**	**24 June 1999 (24.06.99)**

TITLE OF INVENTION
TYRE BALANCING COMPOSITIONS

APPLICANT(S) FOR DO/EO/US
Alvin RONLAN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C.371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). **(unexecuted) (3 Sheets);**
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98;
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. ☒ A FIRST preliminary amendment **(13 sheets);**
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: **PCT International Published Application (WO 01/00430 A1) (with International Search Report) (15 sheets); Certificate of First Class Mailing (1 sheet); and Return Postcard.**

U.S. APPLICATION NO. (if known, see 37 CFR 1 5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NO.
10/019068	PCT/DK00/00331	PVZ-007US

17. ☒ The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) .(a/o November 1, 2000):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO.....**$1040**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$890**

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.455(a)(2)) paid to USPTO **$740**

International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4).....**$710**

International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4).....**$100**

CALCULATIONS PTO USE ONLY	

ENTER APPROPRIATE BASIC FEE AMOUNT =				$890.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☒ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				$130.00	
CLAIMS	**NUMBER FILED**	**NUMBER EXTRA**	**RATE**		
Total claims	**32**-20 =	**12**	X **$18.00**	$216.00	
Independent claims	**2** -3 =	**0**	X **$84.00**	$	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **280.00**	$280.00	
TOTAL OF ABOVE CALCULATIONS =				$1516.00	
☒ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by ½.				$	
SUBTOTAL =				$758.00	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$758.00	
				Amount to be: refunded	$
				charged	

a. ☐ Check in the amount of $_____ to cover the above fees is enclosed.

b. ☒ Please charge my Deposit Account No. **12-0080** in the amount of $ **758.00** to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **12-0080**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Elizabeth A. Hanley, Esq.
LAHIVE & COCKFIELD, LLP
28 State Street
Boston, Massachusetts 02109
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(617)227-7400
Date: 21 December 2001

SIGNATURE

Elizabeth A. Hanley
NAME

33,505
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of: Alvin Ronlan

International Application No.: PCT/DK00/00331

International Filing Date: June 21, 2000

U.S. Serial No.: Not yet assigned

Filed: Herewith

For: *Tyre Balancing Compositions*

Attorney Docket No. PVZ-007US

Group Art Unit: Not yet assigned

Examiner: Not yet assigned

Commissioner for Patents
BOX PCT
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Prior to examination of the above-identified matter, please amend the application as follows:

In the claims:

Please cancel claims 1-12.

Please add new claims 13-41 as follows:

13. **(New)** A tyre balancing composition, which comprises a visco-plastic gel and solid bodies having an average smallest dimension in the range of 0.5-5 mm.

14. **(New)** A tyre balancing composition according to claim 13, wherein the solid bodies have an average ratio between their smallest and their largest dimension of $\alpha \leq 2$.

15. **(New)** A tyre balancing composition according to claim 14, wherein $\alpha \leq 1.5$.

16. **(New)** A tyre balancing composition according to claim 15, wherein α is around 1.

17. **(New)** A tyre balancing composition according to claim 13 or 14, wherein the average smallest dimension of the solid bodies is in the range of 1-4 mm.

18 **(New)** A tyre balancing composition according to claim 17, wherein the average smallest dimension of the solid bodies is around 3 mm.

19. **(New)** A tyre balancing composition according to claim 13, wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22C.

20. **(New)** A tyre balancing composition according to claim 19, wherein the storage modulus (G') is around 9000 Pa at 22°C, and the critical yield stress is around 30 Pa at 22°C.

21. **(New)** A tyre balancing composition according to claim 13 wherein the solid bodies are shaped as prolate or oblate ellipsoids, cylinders, rectangular paralleipipeds, or spheres, or mixtures of such bodies.

22. **(New)** A tyre balancing composition according to claim 13 wherein the apparent specific gravity of the solid bodies is in the range of 500-3000 kg/m^3.

23. **(New)** A tyre balancing composition according to claim 22 wherein the apparent specific gravity of the solid bodies is in the range of 600-2000 kg/m^3.

24. **(New)** A tyre balancing composition according to claim 23 wherein the apparent specific gravity of the solid bodies is in the range of 700-1000 kg/m^3.

25. **(New)** A tyre balancing composition according to claim 24 wherein the apparent specific gravity of the solid bodies is in the range of 800-900 kg/m^3.

26. **(New)** A tyre balancing composition according to claim 13 wherein the solid bodies are made from a material selected from the group consisting of polyolefins, polystyrene, polyvinyl chloride, polyamide, rubber and glass.

27. **(New)** A tyre balancing composition according to claim 13 wherein the weight ratio between the solid bodies and the gel is from 10:1 to 1:10.

28. **(New)** A tyre balancing composition according to claim 27 wherein the weight ratio between the solid bodies and the gel is from 5:1 to 1:5.

29. **(New)** A tyre balancing composition according to claim 28 wherein the weight ratio between the solid bodies and the gel is from 2:1 to 3:1.

30. **(New)** A tyre balancing composition according to claim 29 wherein the weight ratio between the solid bodies and the gel is from 1:1 to 1:2.

31. **(New)** A tyre balancing composition kit comprising
i) a first container containing a visco-plastic gel, and
ii) a second container containing solid bodies having their average smallest dimension in the range of 0.5-5 mm.

32. **(New)** A tyre balancing composition kit according to claim 31 wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22°C.

33. **(New)** A tyre balancing composition kit according to claim 32 wherein the visco-plastic gel has a storage modulus (G') around 9000 Pa at 22°C, and a critical yield stress around 30 Pa at 22°C.

34. **(New)** A tyre balancing composition kit according to claim 31 wherein the solid bodies are as defined in any of claims 14-16, 18 or 21-26.

35. **(New)** A tyre balancing composition kit according to claim 31 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 10:1 to 1:10.

36. **(New)** A tyre balancing composition kit according to claim 35 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 5:1 to 1:5.

37. **(New)** A tyre balancing composition kit according to claim 36 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 2:1 to 3:1.

38. **(New)** A tyre balancing composition kit according to claim 37 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 1:1 to 1:2.

39. **(New)** A tyre balancing composition according to claim 13 contained within the air cavity of a motor vehicle tyre.

40. **(New)** A method for balancing a motor vehicle wheel assembly comprising applying to the inner surface of the tyre i) a tyre balancing composition according to claim 13, or ii) the components of a kit according to claim 31, mounting the tyre on a tyre rim to form a wheel assembly, and

mounting the wheel assembly on a motor vehicle and driving the vehicle for a distance sufficient to allow the balancing composition to balance the wheel assembly, or

mounting the wheel assembly in a device that allows the wheel assembly to be rotated under load conditions similar to those experienced during actual road driving and at a speed where resonance occurs in the wheel assembly, and rotating the wheel for a time sufficient to allow the balancing composition to reduce vibrations to a stable minimum.

41. **(New)** A tyre balancing composition kit according to claim 31 wherein the solid bodies are as defined in claim 17.

REMARKS

Preliminary to examination of this application, Applicant cancels claims 1-12 and adds claims 13-41 to remove multiple dependencies and to address minor matters of form. The foregoing cancellations and amendments are not related to issues of patentability, and introduce no new matter. Applicants submit herewith a "Version with Markings to Show Changes Made," which indicates the specific amendments made to the specification and the claims. For the Examiner's convenience the currently pending claims are set forth in Appendix A. Entry of the foregoing Preliminary Amendment is respectfully in order and requested.

CONCLUSION

In view of the amendments and remarks set forth above, it is respectfully submitted that this application is in condition for allowance. If there are any remaining issues or the Examiner believes that a telephone conversation with Applicants' Agent would be helpful in expediting prosecution of this application, the Examiner is invited to call the undersigned at (617) 227-7400.

Respectfully submitted,

LAHIVE & COCKFIELD, LLP

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Date: **December 21, 2001**

VERSION WITH MARKINGS TO SHOW CHANGES MADE

~~**1. (Canceled)** A tyre balancing composition, which comprises a visco-plastic gel and solid bodies having an average smallest dimension in the range of 0.5-5 mm.~~

~~2. **(Canceled)** A tyre balancing composition according to claim 1, wherein the solid bodies have an average ratio α between their smallest and their largest dimension of α-≤ 2, preferably α-≤1.5, especially around 1.~~

~~3. **(Canceled)** A tyre balancing composition according to claim 1 or 2, wherein the average smallest dimension of the solid bodies is in the range of 1-4 mm. , preferably around 3mm.~~

~~4. **(Canceled)** A tyre balancing composition according to claim 1, wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22°C.~~

~~5. **(Canceled)** A tyre balancing composition according to any of claims 1-4 claim 1 wherein the solid bodies are shaped as prolate or oblate ellipsoids, cylinders, rectangular paralleipipeds, or spheres, or mixtures of such bodies.~~

~~6. **(Canceled)** A tyre balancing composition according to any of claims 1-5 claim 1 wherein the apparent specific gravity of the solid bodies is in the range of 500-3000 kg/m³, preferably 600-2000 kg/m³, in particular 700-1000 kg/m³, especially 800-900 kg/m³.~~

~~7. **(Canceled)** A tyre balancing composition according to any of claims 1-6 claim 1 wherein the solid bodies are made from a material selected from the group consisting of polyolefins, polystyrene, polyvinyl chloride, polyamide, rubber and or glass.~~

~~8. **(Canceled)** A tyre balancing composition according to any of claims 1-7 claim 1 wherein the weight ratio between the solid bodies and the gel is from 10:1 to 1:10, preferably from 5:1 to 1:5, in particular from 2:1 to 3:1, such as from 1:1 to 1:2.~~

~~9. **(Canceled)** A tyre balancing composition kit comprising~~

~~i) a first container containing a visco-plastic gel, preferably a visco-plastic gel as defined in claim 4, and~~
~~ii) a second container containing solid bodies having their average smallest dimension in the range of 0.5-5 mm, preferably solid bodies as defined in any of claims 2, 3, or 5-7.~~

~~10. **(Canceled)** A tyre balancing composition kit according to claim 9 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 10:1 to 1:10, preferably 5:1 to 1:5, inparticular from 2:1 to 3:1, such as from 1:1 to 1:2.~~

~~11. **(Canceled)** A tyre balancing composition according to any of claims 1-8~~ claim ~~1 contained within the air cavity of a motor vehicle tyre.~~

~~12. **(Canceled)** A method for balancing a motor vehicle wheel assembly comprising applying to the inner surface of the tyre i) a tyre balancing composition according to claim 9 or 10~~ claim ~~1, or ii) the components of a kit according to claim 9 or 10, mounting the tyre on a tyre rim to form a wheel assembly, and~~

~~mounting the wheel assembly on a motor vehicle and driving the vehicle for a distance sufficient to allow the balancing composition to balance the wheel assembly, or~~

~~mounting the wheel assembly in a device that allows the wheel assembly to be rotated under load conditions similar to those experienced during actual road driving and at a speed where resonance occurs in the wheel assembly, and rotating the wheel for a time sufficient to allow the balancing composition to reduce vibrations to a stable minimum.~~

New Claims:

13. **(New)** A tyre balancing composition, which comprises a visco-plastic gel and solid bodies having an average smallest dimension in the range of 0.5-5 mm.

14. **(New)** A tyre balancing composition according to claim 13, wherein the solid bodies have an average ratio between their smallest and their largest dimension of $\alpha \leq 2$.

15. **(New)** A tyre balancing composition according to claim 14, wherein $\alpha \leq 1.5$.

16. **(New)** A tyre balancing composition according to claim 15, wherein α is around 1.

17. **(New)** A tyre balancing composition according to claim 13 or 14, wherein the average smallest dimension of the solid bodies is in the range of 1-4 mm.

18 **(New)** A tyre balancing composition according to claim 17, wherein the average smallest dimension of the solid bodies is around 3 mm.

19. **(New)** A tyre balancing composition according to claim 13, wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22C.

20. **(New)** A tyre balancing composition according to claim 19, wherein the storage modulus (G') is around 9000 Pa at 22°C, and the critical yield stress is around 30 Pa at 22°C.

21. **(New)** A tyre balancing composition according to claim 13 wherein the solid bodies are shaped as prolate or oblate ellipsoids, cylinders, rectangular paralleipipeds, or spheres, or mixtures of such bodies.

22. **(New)** A tyre balancing composition according to claim 13 wherein the apparent specific gravity of the solid bodies is in the range of 500-3000 kg/m^3.

23. **(New)** A tyre balancing composition according to claim 22 wherein the apparent specific gravity of the solid bodies is in the range of 600-2000 kg/m^3.

24. **(New)** A tyre balancing composition according to claim 23 wherein the apparent specific gravity of the solid bodies is in the range of 700-1000 kg/m^3.

25. **(New)** A tyre balancing composition according to claim 24 wherein the apparent specific gravity of the solid bodies is in the range of 800-900 kg/m^3.

26. **(New)** A tyre balancing composition according to claim 13 wherein the solid bodies are made from a material selected from the group consisting of polyolefins, polystyrene, polyvinyl chloride, polyamide, rubber and glass.

27. **(New)** A tyre balancing composition according to claim 13 wherein the weight ratio between the solid bodies and the gel is from 10:1 to 1:10.

28. **(New)** A tyre balancing composition according to claim 27 wherein the weight ratio between the solid bodies and the gel is from 5:1 to 1:5.

29. **(New)** A tyre balancing composition according to claim 28 wherein the weight ratio between the solid bodies and the gel is from 2:1 to 3:1.

30. **(New)** A tyre balancing composition according to claim 29 wherein the weight ratio between the solid bodies and the gel is from 1:1 to 1:2.

31. **(New)** A tyre balancing composition kit comprising

i) a first container containing a visco-plastic gel, and

ii) a second container containing solid bodies having their average smallest dimension in the range of 0.5-5 mm.

32. **(New)** A tyre balancing composition kit according to claim 31 wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22°C.

33. **(New)** A tyre balancing composition kit according to claim 32 wherein the visco-plastic gel has a storage modulus (G') around 9000 Pa at 22°C, and a critical yield stress around 30 Pa at 22°C.

34. **(New)** A tyre balancing composition kit according to claim 31 wherein the solid bodies are as defined in any of claims 14-16, 18 or 21-26.

35. **(New)** A tyre balancing composition kit according to claim 31 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 10:1 to 1:10.

36. **(New)** A tyre balancing composition kit according to claim 35 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 5:1 to 1:5.

37. **(New)** A tyre balancing composition kit according to claim 36 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 2:1 to 3:1.

38. **(New)** A tyre balancing composition kit according to claim 37 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 1:1 to 1:2.

39. **(New)** A tyre balancing composition according to claim 13 contained within the air cavity of a motor vehicle tyre.

40. **(New)** A method for balancing a motor vehicle wheel assembly comprising applying to the inner surface of the tyre i) a tyre balancing composition according to claim 13, or ii) the components of a kit according to claim 31, mounting the tyre on a tyre rim to form a wheel assembly, and

mounting the wheel assembly on a motor vehicle and driving the vehicle for a distance sufficient to allow the balancing composition to balance the wheel assembly, or

mounting the wheel assembly in a device that allows the wheel assembly to be rotated under load conditions similar to those experienced during actual road driving and at a speed where resonance occurs in the wheel assembly, and rotating the wheel for a time sufficient to allow the balancing composition to reduce vibrations to a stable minimum.

41. **(New)** A tyre balancing composition kit according to claim 31 wherein the solid bodies are as defined in claim 17.

APPENDIX A

13. A tyre balancing composition, which comprises a visco-plastic gel and solid bodies having an average smallest dimension in the range of 0.5-5 mm.

14. A tyre balancing composition according to claim 13, wherein the solid bodies have an average ratio between their smallest and their largest dimension of $\alpha \leq 2$.

15. A tyre balancing composition according to claim 14, wherein $\alpha \leq 1.5$.

16. A tyre balancing composition according to claim 15, wherein α is around 1.

17. A tyre balancing composition according to claim 13 or 14, wherein the average smallest dimension of the solid bodies is in the range of 1-4 mm.

18 A tyre balancing composition according to claim 17, wherein the average smallest dimension of the solid bodies is around 3 mm.

19. A tyre balancing composition according to claim 13, wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22C.

20. A tyre balancing composition according to claim 19, wherein the storage modulus (G') is around 9000 Pa at 22°C, and the critical yield stress is around 30 Pa at 22°C.

21. A tyre balancing composition according to claim 13 wherein the solid bodies are shaped as prolate or oblate ellipsoids, cylinders, rectangular paralleipipeds, or spheres, or mixtures of such bodies.

22. A tyre balancing composition according to claim 13 wherein the apparent specific gravity of the solid bodies is in the range of 500-3000 kg/m^3.

23. A tyre balancing composition according to claim 22 wherein the apparent specific gravity of the solid bodies is in the range of 600-2000 kg/m^3.

24. A tyre balancing composition according to claim 23 wherein the apparent specific gravity of the solid bodies is in the range of 700-1000 kg/m^3.

25. A tyre balancing composition according to claim 24 wherein the apparent specific gravity of the solid bodies is in the range of 800-900 kg/m^3.

26. A tyre balancing composition according to claim 13 wherein the solid bodies are made from a material selected from the group consisting of polyolefins, polystyrene, polyvinyl chloride, polyamide, rubber and glass.

27. A tyre balancing composition according to claim 13 wherein the weight ratio between the solid bodies and the gel is from 10:1 to 1:10.

28. A tyre balancing composition according to claim 27 wherein the weight ratio between the solid bodies and the gel is from 5:1 to 1:5.

29. A tyre balancing composition according to claim 28 wherein the weight ratio between the solid bodies and the gel is from 2:1 to 3:1.

30. A tyre balancing composition according to claim 29 wherein the weight ratio between the solid bodies and the gel is from 1:1 to 1:2.

31. A tyre balancing composition kit comprising
i) a first container containing a visco-plastic gel, and
ii) a second container containing solid bodies having their average smallest dimension in the range of 0.5-5 mm.

32. A tyre balancing composition kit according to claim 31 wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22°C.

33. A tyre balancing composition kit according to claim 32 wherein the visco-plastic gel has a storage modulus (G') around 9000 Pa at 22°C, and a critical yield stress around 30 Pa at 22°C.

34. A tyre balancing composition kit according to claim 31 wherein the solid bodies are as defined in any of claims 14-16, 18 or 21-26.

35. A tyre balancing composition kit according to claim 31 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 10:1 to 1:10.

36. A tyre balancing composition kit according to claim 35 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 5:1 to 1:5.

37. A tyre balancing composition kit according to claim 36 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 2:1 to 3:1.

38. A tyre balancing composition kit according to claim 37 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 1:1 to 1:2.

39. A tyre balancing composition according to claim 13 contained within the air cavity of a motor vehicle tyre.

40. A method for balancing a motor vehicle wheel assembly comprising applying to the inner surface of the tyre i) a tyre balancing composition according to claim 13, or ii) the components of a kit according to claim 31, mounting the tyre on a tyre rim to form a wheel assembly, and

> mounting the wheel assembly on a motor vehicle and driving the vehicle for a distance sufficient to allow the balancing composition to balance the wheel assembly, or
>
> mounting the wheel assembly in a device that allows the wheel assembly to be rotated under load conditions similar to those experienced during actual road driving and at a speed where resonance occurs in the wheel assembly, and rotating the wheel for a time sufficient to allow the balancing composition to reduce vibrations to a stable minimum.

41. A tyre balancing composition kit according to claim 31 wherein the solid bodies are as defined in claim 17.

TYRE BALANCING COMPOSITIONS

FIELD OF THE INVENTION

The present invention relates to tyre balancing compositions for use in eliminating/reducing vibrations in motor vehicle wheel assemblies related to tyre and rim imperfections, as well as to the use of such compositions.

BACKGROUND OF THE INVENTION.

Vibrations in rolling wheel assemblies (tyre + rim) are caused by several, different types of tyre imperfections, the most important being:

- Non-homogeneous mass distribution
- Stiffness variations
- Geometric variations
- Radial and lateral run outs
- Eccentricity

Similarly, imperfections in the rim will also induce vibrations.

The at present most common method for elimination of wheel assembly derived vibrations is still the attachment of lead weights to the tyre rim. However, quite apart from giving rise to a diffuse lead pollution in the environment through the weights falling off, this method can only compensate (and even at best only partially) for vibrations caused by non-homogeneous mass distribution in the wheel assembly, and since the other imperfections mentioned above are just as important sources of vibrations, lead weight balancing is not a satisfactory method for balancing of modern quality tyres.

European Patent No. 0557365 describes a different approach to reduction of vibrations induced by wheel assembly imperfections, comprising introduction of a visco-plastic gel into the tyre cavity. The principle behind the action of such gels is that they are able to flow under the stresses induced by vibrations and therefore spontaneously distribute themselves in a rolling tyre in such a way that the vibrations are reduced irrespective of what type of imperfections they are induced by. The efficiency of these balancing gels as compared to lead weight balancing can be demonstrated experimentally by measuring

vertical accelerations on the spring leg of a front axle with its wheels running under load against a rotating drum. Typical results have shown that lead weight balancing actually increases vertical accelerations which clearly demonstrates that other sources of vibrations than non-homogeneous mass distribution are more important in this case. However, such balancing gels cannot completely eliminate vibrations caused by wheel assembly imperfections, because the centrifugal stress induced in a balancing gel by localised thickening (which occurs to diminish vibrations) will eventually be as strong as the residual vibrational forces caused by the imperfections, and therefore an equilibrium is established where a certain level of vertical accelerations will remain.

Also, a drawback with gel compositions in general is that a fairly large amount of gel must employed per tyre since a gel is not able to form localized "lumps" in the manner of a lead weight but must instead form a film layer with a continuously and gradually changing depth in order to provide the required balancing.

SUMMARY OF THE INVENTION.

The object of the present invention is to eliminate or substantially reduce the above mentioned remaining level of vertical accelerations as well as provide a significant reduction of the amount of composition needed per tyre. It has now been found that by incorporating or imbedding into the gel layer a certain amount of solid masses or bodies of a certain size, said size being at least sufficiently large to enable the bodies to move through the gel layer under the influence of acceleration forces induced by imbalances, but not so large so as to themselves begin to induce vibrations, greatly enhances and expands the ability of the composition to reduce vibration and to balance wheel assemblies.

The invention therefore concerns a tyre balancing composition which comprises on the one hand a visco-plastic gel and on the other hand solid bodies having an average smallest dimension in the range of 0.5-5 mm.

In the present context, the term "solid" as applied to the bodies is intended to mean particles having a continuous and fairly smooth surface, but not necessarily having no voids or cavities. Thus, a solid body within the meaning of the present invention may be

hollow or have internal porosities, although a truly solid body, i.e. one having a continuous material phase all through and no cavities or porosities, is preferred.

The invention also relates to a tyre balancing composition kit, a balancing composition according to the invention contained in a wheel assembly, as well as a method for balancing motor vehicle wheel assemblies.

The gels in which the solid bodies are present or imbedded to form the compositions of the invention will in the following be known as DFC (Dynamic Force Compensation) gels.

DETAILED DESCRIPTION OF THE INVENTION

The solid bodies imbedded in the gels to act as moving masses may be any type of solid bodies of the specified dimensions which are able to be dispersed discretely in a visco-plastic gel. In a preferred embodiment, the bodies have an average ratio α between their smallest and their largest dimension of $\alpha \leq 2$ since particles with larger such aspect ratios tend only to move with ease in the longitudinal direction, α preferably being ≤ 1.5, in particular around 1.

Due to the increasing importance with decreasing particle size of molecular interactions (hydrogen bonding, van der Wals forces, electrostatic interactions, etc.) between the solid masses and the visco-plastic gel in relation to the vibrational and centrifugal forces acting on the masses, masses with a average diameter below 0.1 mm do not seem to contribute to the balancing efficiency of the gel-particle composition. Consequently, the smallest dimension of the bodies is, as stated above, in the range 0.5-5 mm. In a preferred embodiment, the average smallest dimension of the bodies is in the range of 1-4 mm, in particular around 3 mm.

Suitable visco-plastic gels that will enable imbedded masses move in order to compensate vibrational forces to a smaller or larger degree can be defined in rheological (as measured with a Stress Tech Rheometer from Rheologica AB, Lund, Sweden) by the following characteristics:

Storage Modulus3 (G'): Between 1000 Pa and 25000 Pa at 22°C

Loss Modulus3 (G"): Smaller than the Storage Modulus

Critical Yield Stress : Exceeding 3 Pa at 22°C.

In a preferred embodiment, the Storage Modulus is around 9000 Pa at 22°C. The Critical Yield Stress is preferably around 30 Pa at 22°C.

In order to interact in a suitable manner with the tyre and the imbedded solid bodies, the composition of the invention should preferably also exhibit suitable adhesive properties ("stickiness") with respect to the tyre and the bodies. Thus, the adhesion between tyre inner lining and the visco-plastic gels as well as the adhesion between imbedded masses and the visco-plastic gels may be evaluated in the following two step practical test:

Step 1:

A two mm thick,100x100 mm square of the visco-plastic gel to be tested is applied to the middle of a sheet (200x200 mm) of chloro-butyl rubber glued onto a stiff support (metal plate) as well as to the middle of a similar sheet of butyl rubber. The two sheets are raised into a vertical position and left standing for 24 hours at 22°C and 65% R.H. If the displacement of the upper rim of the gel-square is less than 3 mm on both test surfaces, the adhesion of the gel component to tyre inner linings is deemed satisfactory.

Step 2:

A two mm thick,100x100 mm square of a visco-plastic gel that conforms to the requirements of Step 1 of this test is applied to the middle of a sheet (200x200 mm) of chloro-butyl rubber glued onto a stiff support (metal plate), and 10 HD polyethylene disk-shaped pellets (specific weight 0.9, disk average diameter: 4.5 mm, disk average height 3 mm) are inserted randomly into the gel. The sheet is raised into a vertical position and left standing for 24 hours at 22°C and 65% R.H. If the average displacement of the pellets is less than 2 mm, the adhesion of the gel component to solid masses is deemed satisfactory.

Visco-plastic gels that conform to both step both Step 1 and Step 2 of this test are considered suitable with respect to adhesive properties.

Apart from the rheological and adhesive criteria defined above, visco plastic gels suitable for use in this invention should preferably also satisfy certain other physical and chemical

criteria that will ensure optimum function under the operating conditions and environment of this particular application, such as:

- compatibility with tyre inner liners,
- proper response and displacement under the action of combined centrifugal and vibrational shear stresses,
- constancy of response over a broad temperature range,
- stability of material properties and response over many years in use,
- chemical inertia of the gel components vis a vis tyre inner liner rubber,
- stability of the gel composition and properties under high g-stress and shear stresses,
- little change in material properties and behaviour upon ageing in normal operating conditions.

The visco-plastic gels, in which the solid bodies are imbedded to form the balancing compositions of the invention, may be of any chemical composition which provides the visco-plastic properties required, preferably as defined above as well as with the other physical and chemical properties enumerated above. Such visco-plastic gels will typically be composed from on the one hand one or more organic base oils having a suitably low viscosity index and on the other hand a gel former. Non-limiting examples of base oils are mineral oil, polyol esters of fatty acids derived from synthetic or naturally occurring polyols and fatty acids, synthetic hydrocarbon oils such as polypropylene oils, poly-alpha-olefins, polybutenes, polyglycols such as liquid polyethylene glycol or liquid polypropylene glycol, or ethylene oxide/propylene oxide copolymers, as well as mixtures thereof. Non-limiting examples of gel formers are colloidal silicas, polyacrylic acids, bentonite clay and metal soaps.

One suitable type of gels are those described in the above mentioned European Patent 0557365 (or its US counterpart US patent 5,431,726 which is hereby incorporated by reference).

The solid bodies may suitably be shaped as prolate or oblate ellipsoids, cylinders, rectangular paralleipipeds, or spheres, or mixtures of such bodies. They may be prepared through any method known in the art such as emulsion polymerisation of polymers or cutting rectangular or circular cross-section extrudates into suitable lengths.

In order that the solid bodies do not interact unduly with the inside of the tyre when under the influence of centrifugal forces, it is preferred that the apparent specific gravity of the solid bodies is in the range of 500-3000 kg/m^3, more preferably 600-2000 kg/m^3, in particular 700-1000 kg/m^3, especially 800-900 kg/m^3. The term "apparent specific gravity" as applied to the solid bodies refers to the ratio between the weight of each individual solid body and the volume enclosed by the outer, continuous surface, Thus, it will be clear that if the bodies are hollow or otherwise include voids or are porous, the apparent specific gravity may lower than the nominal specific gravity of the material from which the bodies are made.

The solid bodies should preferably be made from a material which does not interact unsuitably with the visco-plastic gel. Non-limiting examples of suitable materials for the solid bodies are various polymers such as polyolefins, e.g. polyethylene (either high or low density) or polypropylene; polystyrene; polyvinyl chloride; polyamides, e.g nylons; rubbers such as butyl rubber or latex; or glass.

The content of solid bodies in the composition of the invention may vary within fairly wide limits since the purpose of the bodies is to able to move in the gel layer in order to establish zones with a high concentration of solid bodies to act as balancing elements. The weight ratio between the solid bodies and the gel is preferably from 10:1 to 1:10, more preferably from 5:1 to 1:5, in particular from 2:1 to 3:1, such as from 1:1 to 1:2.

It will be evident that in order to work the invention, imbedding the solid bodies in the visco-plastic gel to form the composition of the invention need not take place outside the tyre. Thus, when applying the teaching of the present invention, it will also possible to instead first distribute a suitable amount of a visco-plastic gel on the inside of a tyre and subsequently distribute a suitable amount of solid bodies on the gel layer, thereby forming a composition of the invention.

Consequently, the invention further concerns a tyre balancing composition kit comprising

i) a first container containing a visco-plastic gel, and

ii) a second container containing solid bodies having their average smallest dimension in the range of 0.5-5 mm.

The visco-plastic gel and the solid bodies, respectively, preferably are defined as and/or exhibit the properties and attributes listed above.

In a preferred embodiment of the balancing kit of the invention, the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 10:1 to 1:10, preferably from 5:1 to 1:5, in particular from 2:1 to 3:1, such as from 1:1 to 1:2.

In a particularly preferred embodiment, and in order to eliminate or reduce any errors in applying them in the correct amounts, the amounts of the visco-plastic gel and the solid bodies in the first and second containers, respectively, of the balancing kit according to the invention are adapted to be applied to one single automobile tyre, whether a passenger automobile tyre, a truck tyre or the like. Such amounts will typically be from 50 to 400 g per tyre for passenger vehicle tyres, and 300-1000 g per tyre for truck tyres.

Due to the above described possibility of not combining the visco-plastic gel and solid bodies until in the tyre, the present invention likewise further relates to a tyre balancing composition according to the invention as defined above contained within the air cavity of a motor vehicle tyre.

Finally, the invention also relates to a method for balancing a motor vehicle wheel assembly, said method comprising the steps of

applying to the inner surface of the tyre

i) a tyre balancing composition as defined above, or

ii) the components of a tyre balancing kit as defined above;

mounting the tyre on a tyre rim to form a wheel assembly; and

mounting the wheel assembly on a motor vehicle and driving the vehicle for a distance sufficient to allow the balancing composition to balance the wheel assembly, or

mounting the wheel assembly in a device that allows the wheel assembly to be rotated under load conditions similar to those experienced during actual road

driving and at a speed where resonance occurs in the wheel assembly, and rotating the wheel for a time sufficient to allow the balancing composition to reduce vibrations to a stable minimum.

The amount of visco-plastic gel applied to the inside of the tyre should preferably be in the range of 0.01-1 grams per cm^2, more preferably 0.02-0.5 grams, in particular 0.02-0.1 grams per cm^2, of the inner lining surface of the tyre adjacent the part of the tyre that actually contacts the road (the tyre tread). The amount of solid masses in the tyre balancing kit of the invention applied to the inside of the tyre should preferably be between 10 and 200 g for car tyres and between 50 and 500 g for truck tyres, more preferably between 10 and 100 g for car tyres and between 50 and 300 g for truck tyres, in particular 20-80 g and 80-150 g, respectively.

The invention is further illustrated by the following non-limiting examples.

EXAMPLE 1

A DFC-gel (250 g) consisting of 1 weight part of HD polyethylene disks (specific weight 0.9, disk average diameter: 4.5 mm, disk average height 3 mm), and 2 weight parts of a visco-plastic gel according to European patent no. 0557365 and consisting of an ethylene oxide (EO)/propylene oxide(PO) copolymer (UCON 50-HB-5100 from Union Carbide, theoretical molecular weight equal to 4000) and fumed silica (Aerosil 202 from Degussa), was introduced into the cavity of a Michelin 175/65/R14 tyre. The tyre was mounted on a car and driven until all vibrations disappeared. The wheel assembly was dismounted from the car, and measurement in a spin-balancing machine showed only insignificant residual weight imbalance. Inspection of the inner tyre wall showed an uneven distribution of the polyethylene pellets as would be expected if balancing is to take place.

EXAMPLE 2

100 g of a visco-plastic gel according to European patent no. 0557365 and consisting of an ethylene oxide/propylene oxide copolymer (L1 from Lyondell Chemical Worldwide, Inc., EO to PO ratio equal to 1:1 and theoretical molecular weight (Mw) equal to 6500)

(74.0%), castor oil No. 1 (18.5%) and fumed silica (Aerosil A300 from Degussa) (7.5%) was introduced into the cavity of a Michelin 175/65/R14 tyre and spread around the inner perimeter. HD polyethylene disks (specific weight 0.9, disk average diameter: 4.5 mm, disk average height 3 mm) were then sprinkled evenly on top of the gel layer. The tyre was mounted on a car and driven until all vibrations disappeared. The wheel assembly was dismounted from the car, and measurement in a spin-balancing machine showed only insignificant residual weight imbalance. Inspection of the inner tyre wall showed a distribution of the polyethylene pellets as would be expected if balancing is to take place.

EXAMPLE 3

250 g of a visco-plastic gel according to European patent no. 0557365 and consisting of 93% of a 4:1 mixture of two ethylene oxide/propylene oxide copolymers (L1 from Lyondell Chemical Worldwide, Inc., EO to PO ratio equal to 1:1 and theoretical molecular weight (Mw) equal to 6500 (4 parts), and L1-Diol from Lyondell Chemical Worldwide, Inc., EO to PO ratio equal to 1:1 and theoretical molecular weight (Mw) equal to 13000) (1 part)) and 7% of fumed silica (Cab-O-Sil TS720 from Cabot Corporation) was introduced into the cavity of a Michelin XH4 235/75/15 tyre and spread around the inner perimeter. LD polyethylene spheres (specific weight 0.85, sphere average diameter: 4 mm) were then sprinkled evenly on top the gel layer. The tyre was mounted on a sports utility vehicle and driven until all vibrations disappeared. The wheel assembly was dismounted from the vehicle, and measurement in a spin-balancing machine showed only insignificant residual weight imbalance. Inspection of the inner tyre wall showed a distribution of the polyethylene spheres as would be expected if balancing is to take place.

CLAIMS

1. A tyre balancing composition, which comprises a visco-plastic gel and solid bodies having an average smallest dimension in the range of 0.5-5 mm.

2. A tyre balancing composition according to claim 1, wherein the solid bodies have an average ratio α between their smallest and their largest dimension of $\alpha \leq 2$, preferably $\alpha \leq 1.5$, especially around 1.

3. A tyre balancing composition according to claim 1 or 2, wherein the average smallest dimension of the solid bodies is in the range of 1-4 mm, preferably around 3 mm.

4. A tyre balancing composition according to any of claims 1-3, wherein the visco-plastic gel has a storage modulus (G') between 1000 Pa and 25000 Pa at 22°C, preferably around 9000 Pa at 22°C, a loss modulus (G") smaller than the storage modulus, and a critical yield stress above 3 Pa at 22°C, preferably around 30 Pa at 22°C.

5. A tyre balancing composition according to any of claims 1-4 wherein the solid bodies are shaped as prolate or oblate ellipsoids, cylinders, rectangular paralleipipeds, or spheres, or mixtures of such bodies.

6. A tyre balancing composition according to any of claims 1-5 wherein the apparent specific gravity of the solid bodies is in the range of 500-3000 kg/m^3, preferably 600-2000 kg/m^3, in particular 700-1000 kg/m^3, especially 800-900 kg/m^3.

7. A tyre balancing composition according to any of claims 1-6 wherein the solid bodies are made from polyolefins, polystyrene, polyvinyl chloride, polyamide, rubber or glass.

8. A tyre balancing composition according to any of claims 1-7 wherein the weight ratio between the solid bodies and the gel is from 10:1 to 1:10, preferably from 5:1 to 1:5, in particular from 2:1 to 3:1, such as from 1:1 to 1:2.

9. A tyre balancing composition kit comprising

i) a first container containing a visco-plastic gel, preferably a visco-plastic gel as defined in claim 4, and

ii) a second container containing solid bodies having their average smallest dimension in the range of 0.5-5 mm, preferably solid bodies as defined in any of claims 2, 3 or 5-7.

10. A tyre balancing composition kit according to claim 9 wherein the weight ratio between the amount of visco-plastic gel in the first container and the amount of solid bodies in the second container is from 10:1 to 1:10, preferably from 5:1 to 1:5, in particular from 2:1 to 3:1, such as from 1:1 to 1:2.

11. A tyre balancing composition according to any of claims 1-8 contained within the air cavity of a motor vehicle tyre.

12. A method for balancing a motor vehicle wheel assembly comprising applying to the inner surface of the tyre i) a tyre balancing composition according to any of claims 1-8, or ii) the components of a kit according to claim 9 or 10, mounting the tyre on a tyre rim to form a wheel assembly, and

mounting the wheel assembly on a motor vehicle and driving the vehicle for a distance sufficient to allow the balancing composition to balance the wheel assembly, or

mounting the wheel assembly in a device that allows the wheel assembly to be rotated under load conditions similar to those experienced during actual road driving and at a speed where resonance occurs in the wheel assembly, and rotating the wheel for a time sufficient to allow the balancing composition to reduce vibrations to a stable minimum.

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(54) Title: TYRE BALANCING COMPOSITIONS

(57) Abstract: The invention relates to tyre balancing compositions having improved balancing properties comprise a visco-plastic gel and solid bodies having an average smallest dimension in the range of 0.5-5 mm; preferably 1-4 mm, more preferably around 3 mm. When applied in a layer to the inside of a motor vehicle tyre, the compositions act by allowing the solid bodies move through the gel and to concentrate in areas to counteract imbalances. The solid bodies preferably have an average ratio α between their smallest and their largest dimension of $\alpha \leq 2$, more preferably $\alpha \leq 1.5$, especially around 1. The visco-plastic gel preferably has a storage modulus (G') between 1000 Pa and 25000 Pa at 22 °C, a loss modulus (G'') smaller than the storage modulus, and a critical yield stress above 3 Pa at 22 °C. The bodies may be shaped as prolate or oblate ellipsoids, cylinders, rectangular parallelipipeds, or spheres, or mixtures of such bodies; they may have an apparent specific gravity in the range of 500-3000 kg/m^3, preferably 600-2000 kg/m^3, in particular 700-1000 kg/m^3, especially 800-900 kg/m^3; they may be made from polyolefins, polystyrene, polyvinyl chloride, polyamide, rubber or glass. The weight ratio between the solid bodies and the gel is from 10:1 to 1:10, preferably from 5:1 to 1:5, in particular from 2:1 to 3:1, such as from 1:1 to 1:2. The invention further concerns a tyre balancing kit and a method for balancing automobile wheel assemblies.

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US

DECLARATION, PETITION AND POWER OF ATTORNEY FOR PATENT APPLICATION

(Check one):

- ☐ Declaration Submitted with Initial Filing
- ☒ Declaration Submitted after Initial Filing

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

TYRE BALANCING COMPOSITIONS

the specification of which (check one):

☐ is attached hereto.

OR

☒ was filed on **21 June 2000** as PCT International Application Number **PCT/DK00/00331** and was filed on 21 December 2001 as U.S.S.N. 10/019,068

- ☐ and was amended by PCT Article 19 Amendment on _____ (if applicable),
- ☐ and was amended by PCT Article 34 Amendment on _____ (if applicable).

I acknowledge the duty to disclose to the Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

I hereby state that I have reviewed and understood the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

PRIORITY CLAIM

(Check one):

☐ no such applications have been filed.

☒ such applications have been filed as follows

1) FOREIGN PRIORITY CLAIM: I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate or §365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (dd,mm,yyyy)	Priority Not Claimed	Certified Copy Attached Yes	Certified Copy Attached No
99112199.7	EP	24 June 1999 (24.06.1999)	☐	☐	☒
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority sheet attached hereto.

2) PROVISIONAL PRIORITY CLAIM: I hereby claim the benefit under Title 35, United States Code §119(e) of any United States provisional application(s) listed below.

Provisional Application Number(s)	Filing Date (dd/mm/yyyy)

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3) U.S./PCT PRIORITY CLAIM: I hereby claim the benefit under Title 35, United States Code, §120 of any United States application or §365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Number	Parent Filing Date (dd/mm/yyyy)	Parent Patent Number *(if applicable)*

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POWER OF ATTORNEY

As a named inventor, I hereby appoint the following attorneys and/or agents to prosecute this application and transact all business in the Patent and Trademark Office connected therewith.

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Wherefore I petition that letters patent be granted to me for the invention or discovery described and claimed in the attached specification and claims, and hereby subscribe my name to said specification and claims and to the foregoing declaration, power of attorney, and this petition.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

100

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